



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/742,433	12/22/2000	Tomoyuki Hiroki	35.G2698	8881

5514 7590 10/19/2004

FITZPATRICK CELLA HARPER & SCINTO  
30 ROCKEFELLER PLAZA  
NEW YORK, NY 10112

EXAMINER

ZERVIGON, RUDY

ART UNIT PAPER NUMBER

1763

DATE MAILED: 10/19/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

09/742,433

Applicant(s)

HIROKI, TOMOYUKI

Examiner

Rudy Zervigon

Art Unit

1763

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 30 July 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-7 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-7 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some \* c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_

## DETAILED ACTION

### *Continued Examination Under 37 CFR 1.114*

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on June 18, 2004 has been entered.

### *Claim Rejections - 35 USC § 103*

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1-7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshinao Miyata (USPat. 5,992,974) in view of O'Neill, James F. et al (US 4,875,968 A). Yoshinao Miyata teaches a method ("Detailed Description") of manufacturing a liquid jet recording head (Fig.5h) which comprises an element substrate ("silicon monocrystal"; 40; Figures 5(a)-5(h); column 6, lines 21-28) provided with a plurality of discharge energy generating elements (44, 47, 45; column 6, lines 47-50) for applying discharge energy (column 3, lines 34-41) to a recording liquid in accordance with image data (column 2, lines 13-45, abstract). Yoshinao Miyata further teaches:

- i. a liquid chamber (2, Figures 5(e)-5(g))

Art Unit: 1763

- ii. a top plate (6,40, Figures 5(a)-5(h)) having a plurality of nozzles (7) and made from silicon wafer having a <110> orientated surface (column 3, lines 41-48)
- iii. the top plate (6,40, Figures 5(a)-5(h)) and the element substrate are “jointed” (column 7, lines 49-53) so that each of the discharge energy generating elements face the respective nozzle (7, Figure 5(h))
- iv. a mask layer (“protecting layer”, 41; column 8, lines 20-27) provided on a nozzle surface (lower surface of 6, Figure 5(a) and 5(h)) of the top plate (6,40, Figures 5(a)-5(h))
- v. compensation patterns (“supply ports” 61, 4,; Fig.7(a), 5(f), 5(g); “ink reservoirs” 3, 51,; Fig.7(a), 5(f), 5(g); 41, 41’, 41’’; Figures 5(d)-5(g); 6, Figure 2, 5(h)) extending to a liquid chamber (2, Figures 5(e)-5(g)) region in order to from the nozzles and the liquid chamber (2, Figures 5(e)-5(g)) by anisotropic etching (claim 8; column 5, lines 17-23)
- vi. steps for performing anisotropic etching of the top plate (6,40, Figures 5(a)-5(h)) through the mask layer (“protecting layer”, 41; column 8, lines 20-27) and forming the liquid chamber (2, Figures 5(e)-5(g)) to have a substantially rectangular shape at the nozzle surface of the top plate by over-etching portions with the compensation patterns (“supply ports” 61, 4,; Fig.7(a), 5(f), 5(g); “ink reservoirs” 3, 51,; Fig.7(a), 5(f), 5(g); 41, 41’, 41’’; Figures 5(d)-5(g); 6, Figure 2, 5(h)) – column 7, line 65 – column 8, line 6
- vii. compensation patterns (“supply ports” 61, 4,; Fig.7(a), 5(f), 5(g); “ink reservoirs” 3, 51,; Fig.7(a), 5(f), 5(g); 41, 41’, 41’’; Figures 5(d)-5(g); 6, Figure 2, 5(h)) are comb-shaped (Figure 7(a)) and are arranged to oppose each other so as to define a ladder-shaped opening region between the compensation patterns (“supply ports” 61, 4,; Fig.7(a), 5(f),

Art Unit: 1763

- 5(g); “ink reservoirs” 3, 51,; Fig.7(a), 5(f), 5(g); 41, 41’, 41’’; Figures 5(d)-5(g); 6, Figure 2, 5(h)) at the center portion (7) of the liquid chamber (2, Figures 5(e)-5(g)) region
- viii. compensation patterns (“supply ports” 61, 4,; Fig.7(a), 5(f), 5(g); “ink reservoirs” 3, 51,; Fig.7(a), 5(f), 5(g); 41, 41’, 41’’; Figures 5(d)-5(g); 6, Figure 2, 5(h)) are arranged to oppose each other so as to define a substantially H-shaped opening region between the compensation patterns (“supply ports” 61, 4,; Fig.7(a), 5(f), 5(g); “ink reservoirs” 3, 51,; Fig.7(a), 5(f), 5(g); 41, 41’, 41’’; Figures 5(d)-5(g); 6, Figure 2, 5(h)) at the center portion (7) of the liquid chamber region
- ix. a step of performing anisotropic etching (column 7, line 65 – column 8, line 6) of the top plate (column 3, lines 41-54) using the compensation patterns (“supply ports” 61, 4,; Fig.7(a), 5(f), 5(g); “ink reservoirs” 3, 51,; Fig.7(a), 5(f), 5(g); 41, 41’, 41’’; Figures 5(d)-5(g); 6, Figure 2, 5(h)) as a mask so that:
- a. to top plate is over-etched (7; Fig.5(h))
  - b. the liquid chamber having a substantially rectangular shape (Fig.5(h)) at the nozzle surface of the top plate is formed
- x. the compensation patterns (“supply ports” 61, 4,; Fig.7(a), 5(f), 5(g); “ink reservoirs” 3, 51,; Fig.7(a), 5(f), 5(g); 41, 41’, 41’’; Figures 5(d)-5(g); 6, Figure 2, 5(h)) extending into the liquid chamber (2, Figures 5(e)-5(g)) are removed (voids 61,7,51; Fig.7(a) resulting from etching) after the liquid chamber (2, Figures 5(e)-5(g)) is formed, as claimed by claim 7

Yoshinao Miyata further teaches compensation patterns (6,7; Figure 2) “lines” (interpreted as vertices) having an angle of 35° (both sides) relative to the <111> plane in the nozzle direction of

Art Unit: 1763

the silicon wafer (6; column 3, line 64). Yoshinao Miyata further teaches at least one line (line at “7”; Figure 2) parallel to the nozzle array direction, and the compensation patterns (7; Figure 2, 7(a)) are arranged to oppose each other (Figure 7(a)) separated by an opening region (51) in the center portion of the liquid chamber (2, Figures 5(e)-5(g)) region. Yoshinao Miyata does not teach “lines” having angles of 55° and 71° relative to the <111> plane in the nozzle direction of the silicon wafer.

Yoshinao Miyata does not teach over-etching Yoshinao Miyata’s mask layer (“protecting layer”, 41; column 8, lines 20-27) such that Yoshinao Miyata’s liquid chamber (2, Figures 5(e)-5(g)) is formed beneath the mask layer.

O'Neill, James F. et al teaches a method of fabricating ink jet printheads where his etch resistane mask (25; Figure 5; column 6, lines 28-51) remains, after etching, to form a liquid chamber (24; Figure 5; column 6, lines 28-51) beneath the mask layer.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to over-etching Yoshinao Miyata’s mask layer (“protecting layer”, 41; column 8, lines 20-27) such that Yoshinao Miyata’s liquid chamber (2, Figures 5(e)-5(g)) is formed beneath the mask layer as taught by O'Neill, further to optimize Yoshinao Miyata’s 35° angle formed between a compensation pattern line and the <111> plane of the silicon wafer to 55° and 71° in the nozzle direction of the silicon wafer.

Motivation to over-etching Yoshinao Miyata’s mask layer (“protecting layer”, 41; column 8, lines 20-27) such that Yoshinao Miyata’s liquid chamber (2, Figures 5(e)-5(g)) is formed beneath the mask layer as taught by O'Neill, further to optimize Yoshinao Miyata’s 35° angle formed between a compensation pattern line and the <111> plane of the silicon wafer to 55° and 71° in

Art Unit: 1763

the nozzle direction of the silicon wafer is for creating sufficient clearance for discharge energy generating elements ("addressing electrodes"; column 6, lines 28-51), further, motivation to optimize Yoshinao Miyata's 35° angle formed between a compensation pattern line and the <111> plane of the silicon wafer to 55° and 71° in the nozzle direction of the silicon wafer is to optimize directional flow rate of the ejected ink.

***Response to Arguments***

4. Applicant's arguments filed June 18, 2014 are persuasive. However, Applicant's arguments are moot in view of the new grounds of rejection

***Conclusion***

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Rudy Zervigon whose telephone number is (571) 272-1442. The examiner can normally be reached on a Monday through Thursday schedule from 8am through 7pm. The official after fax phone number for the 1763 art unit is (703) 872-9306. Any Inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Chemical and Materials Engineering art unit receptionist at (571) 272-1700. If the examiner can not be reached please contact the examiner's supervisor, Gregory L. Mills, at (571) 272-1439.

*Rudy Zervigon*  
10/17/14